

**ARGONNE NATIONAL LABORATORY - WEST**

**SITE PROFILE**

**December 1999**

**Office of Oversight  
Environment, Safety and Health  
U.S. Department of Energy**

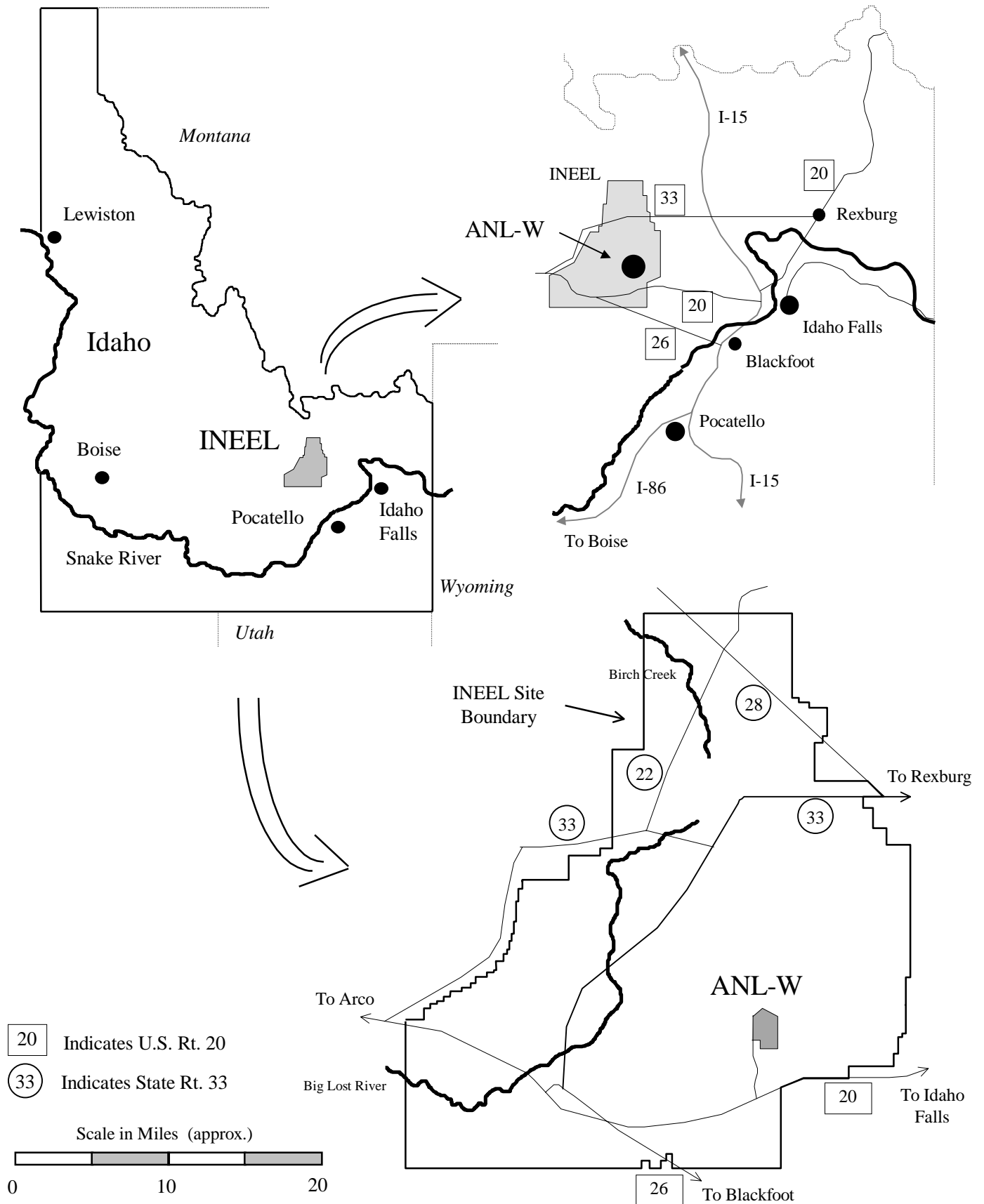
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Site profiles provide information on Department of Energy sites, including background; major environment, safety, and health initiatives and activities; items for management attention; and performance.

The electronic version of this site profile and other Office of Oversight documents referenced in this document can be accessed through the Internet at **<http://tis.eh.doe.gov/oversight/bookcase2.htm>**.

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## ARGONNE NATIONAL LABORATORY - WEST

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### BACKGROUND

#### Description

The Argonne National Laboratory-West (ANL-W), a part of the main Argonne National Laboratory located near Chicago, Illinois, is a complex of laboratories, research installations, and administrative buildings located in southeastern Idaho, 35 miles west of Idaho Falls and 65 miles northeast of Pocatello. ANL-W occupies approximately 810 acres and lies within the confines of the Idaho National Engineering and Environmental Laboratory (INEEL), an 890 square mile reservation set aside for a wide variety of research programs. Most of the INEEL, including the ANL-W site, is an unpopulated, semiarid desert rangeland with sagebrush over volcanic deposits.

The original ANL-W mission revolved around the testing and development of advanced nuclear reactor technology. With the termination of funding for the Department of Energy (DOE) liquid metal reactor program in fiscal year 1995, ANL-W began a search for new missions. ANL-W's current activities involve the demonstration of electro-metallurgical treatment of sodium bonded fuels, placing the EBR-II reactor in a shutdown and radiologically safe condition, and treatment and disposal of EBR-II primary and secondary sodium coolant.

The ANL-W site includes buildings and complexes housing processes used for electrometallurgical treatment of fuel, fuel examination, conversion of reactor coolant sodium from mixed hazardous waste to low-level waste (LLW) to allow for disposal at the INEEL Radioactive Waste Management Complex, and interim storage of highly radioactive scrap (EBR-II fuel) and mixed waste.

*The site's key facilities are described in Appendix A. Each facility's description includes its mission/status, hazard classification/authorization basis, worst-case design basis accident, and principal hazards and vulnerabilities. For the purpose of the profile, a key facility is a facility, building, or complex that is significant from an environment, safety, or health perspective.*

#### Mission

The site states that its mission is to conduct research and development to provide the technology to deal with significant nuclear issues facing the United States, including stabilization of spent nuclear fuel; development and qualification of high-level nuclear waste forms; treatment of reactor coolant sodium waste to allow disposal; nuclear facility decommissioning; and similar activities. Also included are nuclear safety and safeguards and security development, training, and assistance relating to potentially troubled areas in foreign nations. All facilities at the ANL-W site are utilized in the above missions, and a new facility, the Remote Treatment Facility, is being planned to allow treatment of remotely handled waste in accordance with the INEEL Site Treatment Plan.

#### Management

The lead program secretarial office is the Office of Science (SC). The Office of Nuclear Energy, Science and Technology (NE) is the cognizant secretarial office. The Office of Nuclear Facilities Management (NE-40) is the Landlord for ANL-W. The Office of Environmental Management and the Office Fissile Materials Disposition are program support offices.

**Table 1. Principal Organizations and Relationship to ANL-W**

<b>Organization</b>	<b>Relationship to ANL-W</b>
Office of Science (SC)	Provides integrated policy guidance and direction to CH for site activities
Office of Nuclear Energy, Science and Technology, Office of Nuclear Facilities Management (NE-40)	Responsible for providing landlord and programmatic guidance and principal site funding regarding ANL-W operational performance
Office of Environmental Management (EM)	Provides guidance and funding regarding site cleanup
Office of Fissile Materials Disposition (MD)	Provides guidance and funding related to fissile material activities

The DOE Chicago Operations Office (CH) manages contractor activities through the Argonne Group-West (ARG-W), which is located at the site and provides a constant presence.

The contractor is the University of Chicago. The performance-based management contract, which was renewed on September 29, 1999, was originally awarded in 1947.

There are currently six Federal employees and approximately 750 contractor personnel at ANL-W.

### **Budget**

*The information appearing in this section has been gathered from a number of sources and represents the best available budget information at the time of profile publication. This information is dynamic, depending on the point in the budget cycle at which it is obtained. It is included to provide the reader with a sense of the magnitude and sources of the budget for this site. It is not intended to be the definitive source of budget information*

Most of the funding for programs and infrastructure at ANL-W derives from NE's AF95 "Termination" account and includes all of the site's funding for environment, safety, and health (ES&H) activities.

**Table 2. Major DOE Program Funding (In Thousands)**

<b>Organization</b>	<b>FY 1999 Adjusted</b>	<b>FY 2000 Request</b>
Office of Nuclear Energy, Science and Technology (NE)	\$62,000	\$62,000
Office of Fissile Materials Disposition (MD)	\$1,785	\$1,809
Office of Environmental Management (EM)	\$4,570	\$1,344
<b>TOTAL</b>	<b>\$68,355</b>	<b>\$65,153</b>

### **Significant Commitments to Stakeholders**

#### INEEL Site Treatment Plan

An agreement with the state of Idaho addresses the processing of sodium wastes from Fermi-I reactor coolant operations as mandated in the INEEL Site Treatment Plan. This plan is required by the

Federal Facilities Compliance Act (FFCA). The INEEL Site Treatment Plan has milestones for treating sodium mixed waste in the ANL-W Sodium Process Facility. The near-term milestone is to treat 50 percent of the waste sodium (89,000 gallons) by the end of December 1999. The entire inventory of 178,000 gallons of sodium is to be treated by March 2001. At the end of August 1999, 50,000 gallons of

sodium had been treated. However, treatment operations were suspended in September 1999, when it was discovered that some of the treated waste did not meet the treatment process specifications or the waste acceptance criteria at the disposal site. Treatment operations remain suspended pending identification and completion of corrective actions.

#### Federal Facility Agreement

A Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Federal Facility Agreement between DOE, the Environmental Protection Agency (EPA), the State of Idaho, and INEEL governs the cleanup of inactive waste sites at INEEL. DOE has completed the ANL-W Remedial Investigation/Feasibility Study (RI/FS), which was approved by the EPA and the state of Idaho in December 1997. Five sites at ANL-W were identified in the RI/FS report as requiring remedial action to reduce potential risks to human health or the environment. This site is on the National Priorities List. The DOE/EPA/State-preferred remedy for the five sites is phytoremediation, or the use of selected plants to extract shallow-depth cesium and other non-radioactive contaminants. The plants are then harvested and incinerated. The final Record of Decision (ROD) for remediation at ANL-W has been signed by all signature parties of INEEL's Federal Facility Agreement/Consent Order (FFA/CO). Signature parties include the DOE, EPA Region X, and the state of Idaho. Implementation of the phytoremediation project began in May 1999. The cesium-contaminated waste site was planted with a selected weed species. The weeds have been harvested and baled, and they will be incinerated at an INEEL facility. Analysis of the plant tissue will be completed by December 1999, to determine the amount of cesium that was removed by the first crop.

#### **Defense Nuclear Facilities Safety Board (DNFSB) Recommendations**

No DNFSB recommendations apply specifically to ANL-W.

## **MAJOR ENVIRONMENT, SAFETY, AND HEALTH INITIATIVES/ACTIVITIES**

### **Spent Fuel Storage and Management**

As part of the shutdown of EBR-II, all fuel was removed from the reactor, packaged, and put in retrievable storage at the ANL-W Radioactive Scrap and Waste Facility (RSWF). The Fuel Conditioning Facility (FCF) is currently being used to demonstrate the electrometallurgical treatment of sodium bonded spent nuclear fuel. This process removes the uranium from the spent fuel while the transuranic elements and fission products remain in a salt mixture, and the sodium chemically combines with the salt mixture to form sodium chloride. The recovered uranium is blended to form a low-enriched uranium product that is placed in storage at the Zero Power Physics Reactor (ZPPR) facility. The transuranic elements and fission products in the salt mixture will be absorbed in a sodalite and fabricated into a ceramic waste form for interim storage at the RSWF. Metal wastes, including fuel element cladding hulls and noble-metal fission products, will be melted into stainless steel-zirconium alloy ingots, which will also be placed in interim storage at the RSWF. The demonstration success criteria were satisfied at the end of August 1999, and the project results are currently being reviewed by a committee of the National Research Council (NRC). Following completion of that review, the NRC will report to DOE with regard to the scientific and technical progress of the project and the viability of electrometallurgical treatment technology.

### **Waste Management**

The ANL-W waste management program was the responsibility of the DOE Office of Environmental Management until FY 1998, when funding and responsibility were

transferred to NE. The ANL-W waste management program currently manages all types of waste generated at ANL-W. Major activities include radioactive and hazardous waste characterization, packaging, and transportation to INEEL disposal facilities. The RSWF provides interim storage for solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition. The Radioactive Liquid Waste Treatment Facility (RLWTF) processes low-level radioactive liquid for disposal at the INEEL Radioactive Waste Management Complex (RWMC). This status has not changed in the last six months.

### **Integrated Safety Management System Implementation**

In May 1997, the University of Chicago and CH formally entered into a partnership agreement that initiated the development of an integrated safety management system (ISMS) consistent with DOE Policy 450.4. The ISMS description has been completed. Contractual changes to accommodate the revised Department of Energy Acquisition Regulations (DEAR) have been completed. A joint DOE/CH and ANL independent pre-verification review of the ANL-W ISMS was conducted May 19-20, 1999, to evaluate the implementation of the ANL-W integrated safety management (ISM) program in preparation for DOE ISMS approval and Phase II ISMS verification, which is scheduled for January 2000.

### **EBR-II Defueling**

EBR-II has been defueled. Additional activities to place EBR-II in a radiologically and industrially safe shutdown condition continue. The reclassification of EBR-II as a non-nuclear radiological facility has been approved by NE-1. This status has not changed in the last six months.

### **Sodium Processing**

The Sodium Process Facility (SPF) commenced operations on December 18, 1998. The facility produces 70 weight-percent sodium hydroxide from the reactor coolant waste that is stored at the ANL-W site. The facility was initially used to treat approximately 30,000 gallons of sodium from the Fermi-I reactor, thus allowing the remaining 48,000 gallons of Fermi-I sodium (which is stored in 55-gallon drums) to be rearranged into a storage configuration that meets Resource Conservation and Recovery Act (RCRA) requirements. SPF will ultimately treat all sodium at ANL-W, including the EBR-II primary and secondary sodium and the remainder of the Fermi-I sodium, a total of 178,000 gallons. At the end of August 1999, 50,000 gallons of sodium had been treated. However, treatment operations were suspended in September 1999, when it was discovered that several of the almost 1000 barrels of solid, 70 weight-percent sodium hydroxide produced by the treatment process also contained liquid sodium hydroxide, which is not allowed by the treatment process specifications or the waste acceptance criteria at the disposal site. Treatment operations remain suspended pending identification and completion of corrective actions.

### **Waste Isolation Pilot Project (WIPP) Waste Characterization and Experiments**

ANL-W uses the Hot Fuel Examination Facility (HFEF) to characterize waste destined to be shipped to WIPP. In addition, gas generation experiments are being conducted in the Blanket Storage Room inside the ZPPR reactor cell. The experiments involve monitoring of gases generated from different waste types. This information will be useful in confirming long-range repository performance predictions. The gas generation experiments were completed at the end of September 1999. ANL-W is awaiting guidance from the Carlsbad Area Office regarding disposition of experimental equipment.

## ENVIRONMENT, SAFETY, AND HEALTH ITEMS FOR MANAGEMENT ATTENTION

### Plutonium Vulnerabilities

*The Plutonium Working Group identified six plutonium vulnerabilities during their assessment at ANL-W. In March 1994, the Secretary of Energy commissioned a Plutonium Working Group to conduct a comprehensive assessment to identify and prioritize the ES&H vulnerabilities that arise from the storage of plutonium in DOE facilities and to determine which are the most dangerous and urgent. Based on the available information about the site's response to identified vulnerabilities, this item is being deleted and will not appear in future updates of the profile, unless significant concerns are identified.*

## RECENT SITE PERFORMANCE

### Major Events

None.

### Results of Major Recent Assessments

#### Office of Oversight Review of Radiation Contamination Incident

On August 19, 1998, during the repair of a manipulator at the Fuel Conditioning Facility (FCF) at ANL-W, 11 workers were contaminated with radioactive material on their skin or clothing. Four of these workers also received internal contamination. Once the contamination was discovered, personnel evacuated the facility, activated the site emergency response organization, and initiated recovery actions. The Office of Oversight conducted an independent review from September 14 to 18, 1998, to evaluate the event, the subsequent emergency response, and the event investigation jointly conducted by Argonne National Laboratory (ANL) and CH.

The Office of Oversight review identified strengths or positive observations associated with this event. The facility personnel were conservative in their decision-making in response to the event. Site personnel were promptly evacuated and surveyed by the health physics technicians. The ANL and CH investigation team effectively evaluated the event and identified the root causes, including the direct cause of the event, the contributing causes, and the root cause for the release. Recognizing the need to comprehensively address this event and two other recent events at FCF, the Laboratory is implementing a corrective action process to effectively address all three events.

The Oversight team identified no additional concerns beyond those reported by the ANL investigation related to the circumstances of the event or the immediate response. However, the Oversight team noted that the corrective action plan does not address several programmatic issues related to this event, such as engineering design changes, unreviewed safety question determinations, emergency preparedness, and radiological control.

The Office of Oversight identified opportunities for improvement in emergency management, radiological controls, and ISM. In emergency management, these opportunities are related to annual full-participation emergency exercises, the ANL-W management representative in the INEEL emergency operations center (EOC) during events involving ANL-W, roles and responsibilities of emergency management personnel, and the ANL-W emergency command center (ECC) checklist. Weaknesses observed in the emergency management program led to communications problems during the response to the event. Program weaknesses were observed in the exercise program, procedure usage, emergency plan implementation, and policy governing emergency management at FCF.

Weaknesses in the radiological control program require further program review. They include the use of contamination surveys and dosimetry requirements and work planning consistent with



the level of hazard in the work to be accomplished.

Weaknesses observed in work planning and feedback mechanisms indicate that improvements in the ISM program are necessary to improve facility safety.

The Laboratory has submitted a corrective action plan to the Office of Oversight addressing the

identified weaknesses and opportunities for improvement. The Laboratory's progress in implementing this corrective action plan is being monitored and tracked by ARG-W staff. Of the ten findings discussed in this corrective action plan, nine have been closed. The remaining open finding is expected to be closed by winter 1999, following successful completion of an upcoming INEEL emergency exercise.

## Appendix A. Key Facility Summary

FACILITY NAME	MISSION/ STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN BASIS ACCIDENT	PRINCIPAL HAZARDS AND VULNERABILITIES
Fuel Conditioning Facility (FCF): Buildings 765 & 709	<b>Mission:</b> Electrometallurgical treatment of fuel <b>Status:</b> Operational	Category (Cat) 2 nuclear facility; Safety Basis - FCF final safety analysis report (FSAR), 3/17/97.	Severe flow reversal in the air cell exhaust system - 50 yr. committed effective dose equivalent (CEDE) at site boundary is $1.3 \times 10^{-2}$ mSv.	Fissile and radioactive solids and gases, exposed heavy metals, hazardous metals, hydrogen, argon, sodium
Experimental Breeder Reactor II (EBR-II): Bldgs. 766-768, 793, 788 & 789	Shutdown and defueled	Reclassified as a Radiological Facility.	Failure of largest sodium storage tank (5000 gal) followed by a sodium fire in the containment pit.	Sodium, hydrogen, and argon
Hot Fuel Examination Facility (HFEF): Building 785	<b>Mission:</b> Fuel examination and storage. <b>Status:</b> Operational	Cat 2 nuclear facility; Safety Basis - Hot Fuel Examination Facility/North Facility Safety Report, ANL-7959. Basis for Interim Operations (BIO) 8/93 – Safety Analysis Report (SAR) has been updated and submitted to DOE for review and comment.	Loss of containment barrier combined with loss of coolant to fuel results in 30 rem to critical organ at site boundary. (Note: This accident is not consistent with current uses of the facility.)	Spent fuel and reactor irradiated nuclear material containing plutonium, fission products, sodium, argon, hydrogen
Zero Power Physics Reactor (ZPPR)	<b>Mission:</b> Simulates wide range of reactor properties while operating at low power levels. <b>Status:</b> Cold standby	Cat 2 nuclear facility; Safety Basis - FSAR Zero Power Plutonium Reactor (ZPPR) Facility, ANL-7471, 6/72, ZPPR Vault Safety Assessment Document (SAD), 1980. BIO (8/93).	Workroom fire; presents no unacceptable risks to personnel or surrounding facilities.	Fissile material (plutonium and uranium), low-level fission products, and small quantities of actinides in the fuel
Sodium Process Facility (SPF), Building 799	<b>Mission:</b> Processes mixed waste Na reactor coolant to LLW before shipment to INEEL for disposal. <b>Status:</b> Operational	Radiological facility per DOE-Std-1027-92; Safety Basis - Safety Analysis Report for Sodium Processing Facility, Bldg.799 (DCN E5274-0041-ES) Rev 1 dated March 1996.	Failure of largest sodium storage tank (5000 gal) followed by a sodium fire in the containment pit.	Caustic, hydrogen gas generation, sodium metal fire, low-level fission products
Neutron Radiography Reactor (NRR): Bldg 785	<b>Mission:</b> Produce neutron radiographs <b>Status:</b> Operational	Cat 2 nuclear facility; safety basis -HFEF Neutron Radiography Facility Reactor SAR, 8/77 (DCN WO170-0015-SA-00) Addendum 9/82 (w--31-109-eng-38)	Failure of cladding in a four element cluster during a loss of coolant, resulting in whole body dose at site boundary of 0.003 mrem	Reactor fuel (enriched uranium and erbium)

## Appendix A. Key Facility Summary (cont'd)

FACILITY NAME	MISSION/ STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN BASIS ACCIDENT	PRINCIPAL HAZARDS AND VULNERABILITIES
Radioactive Scrap Waste Facility (RSWF): Building 771	<b>Mission:</b> Interim storage of high rad. scrap (EBR-II fuel) and mixed waste. <b>Status:</b> Operational	Cat 2 nuclear facility; Safety Basis - FSAR for the RSWF, 1983, ANL Safety Assessment for Storage of EBR-II fuel (1992), Criticality Hazard Control Statement, FE-CHCS-A18. BIO (8/93).	13-foot drop accident of a waste can; no significant consequence at site boundary.	Fissile material, heavy metal, mixed waste, and fission products